support to the theory of the formation of such island-groups as Truk by subsidence. This group was not visited by either Darwin or Dana; and I can well imagine that an investigator seeing this group among the first coral reefs would readily describe the islands as the summits, nearly denuded, of a great island which had gradually sunk. But a closer examination will readily show, I think, that this group is not an exception to the general rule thus far obtaining in all the island groups of the Pacific I have visited during this trip; that we must look to submarine erosion and to a multitude of local mechanical causes for our explanation of the formation of atolls and of barrier and encircling reefs, and that, on the contrary, subsidence has played no part in bringing about existing conditions of the atolls of the South and Central Pacific.

Nowhere have we seen better exemplified than at Truk how important a part is played by the existence of a submarine platform in the growth of coral reefs. The encircling reef protects the many islands of the group against a too rapid erosion, so that they are edged by narrow fringing reefs, and nowhere do we find the wide platforms so essential to the formation of barrier reefs. The effect of the north-east trades blowing so constantly in one direction for the greater part of the year is of course very great; the disintegration and erosion of islands within its influence is incessant, and their action undoubtedly one of the essential factors in shaping the atolls of the different groups, not only according to the local positions of the individual islands, but also according to the geographical position of the groups. Thus far I do not think any observer has given sufficient weight to the importance of the action of the trades in modifying the islands within the limits of the trades, nor has any one noticed that the coral reefs are all situated practically within the limits of the trades both north and south of the equator.

The soundings made going west from Jaluit to Namonuito indicate that the various groups are, as is the case with the neighbouring groups of the Marshalls and Gilberts, isolated peaks with steep slopes rising from a depth of over 2000 fathoms. The line we ran from the northern end of Namonuito to Guam developed the eastern extension of a deep trough running south of the Ladrones. The existence of this trough had been indicated by a sounding of 4475 fathoms to the south-west of Guam made by the *Challenger*. We obtained, about 100 miles south-east of Guam, a depth of 4813 fathoms, a depth surpassed only, if I am not in error, by three soundings made by the *Penguin* in the deep trough extending from Tonga to the Kermadecs, and by three soundings made by the U.S.S. *Nero* also to the eastward of Guam.

Guam is not wholly volcanic; the northern half consists of elevated coralliferous limestone. The vertical cliffs bordering the eastern face rise from a height of 100 to 250 or 300 feet at the northern extremity, and resemble in a way similar islands in the Paumotus (Makatea), Niue, Eua, Vavau and others in the Fijis which had made their cliffs a familiar feature in our explorations. In fact, outside of Viti Levu and Vanua Levu, this is the largest island known to me where we find a combination of volcanic rocks and of elevated coralliferous limestone. The *massif* forming the southern half of the island is volcanic, and the highest ridge, rising to about 1000 feet, runs parallel to the west coast, the longest slope being toward the east.

This volcanic mass has burst through the limestone near Agaña, and the outer western extension of the coralliferous limestone exists only in the shape of a few spurs running out from the volcanic mass, the largest of which are those forming the port of San Luis d'Apra. Near the northern extremity of the island a volcanic mass, Mount Santa Rosa, has burst through the limestone and rises about 150 feet above the general level of that part of the island.

We left Guam in time to reach Rota by day, and found that this island is a mass of elevated coralliferous limestone, the highest cliffs of which reach a height of 800 feet. Perhaps in none of the elevated islands have we been able to observe the terraces of submarine elevation as well as at Rota.

It is quite probable that others of the Ladrones, like Saipan, and the islands to the south, are composed in part at least of elevated limestone, judging from the hydrographic charts and the sketches which accompany them. On many of the northern Ladrones there are active volcanoes, so that it is very possible that the volcanic outbursts which have pushed through the limestones, or have elevated parts of the islands of the group, are of comparatively recent date.

During the last part of our cruise, from Suva to Guam, the unfavorable weather greatly interfered with our deep-sea and pelagic work; in fact with the exception of the soundings made to develop as far as practicable the depths in the regions of the various coral-reef groups we visited, we abandoned all idea of carrying out the deep-sea and pelagic work planned for the district between the Gilbert and Marshall and Caroline groups. To our great disappointment hardly any marine work could be accomplished, and our investigations were limited almost entirely to the study of the coral reefs of the regions passed through.

We were everywhere received with the greatest cordiality and courtesy: by the Governor of the Paumotus, the King of Tonga, Sir George O'Brien (the High Commissioner of the Western Pacific at Suva), Mr. E. Brandeis (the Landes-Hauptmann in charge of the Marshall Islands at Jaluit), and the Governor of the Carolines, and the Japanese authorites.

The work of the expedition was divided between Drs. W. M. Woodworth, A. G. Mayer, and my son Maximilian, who accompanied me as assistants; and Mr. C. H. Townsend, Dr. Moore, and Mr. Alexander of the Fish Commission, who had also been detailed as members of the expedition.

I must also thank Capt. Moser and the officers of the *Albatross* for the untiring interest shown by them during the whole time of our expedition in the work of the ship, which was so foreign to the usual duties of a naval officer.

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE.*

MR. R. S. CLAY, late lecturer in physics at the Birkbeck Institution, has been appointed principal of the Wandsworth Technical Institute.

THE Secondary Education Bill was read a second time in the House of Lords on Monday, after a discussion in which objection was raised to the limited character of the measure, and the large powers reserved for the Board of Education. It is not proposed to carry the Bill beyond the second reading this year.

THE first response to Mr. Chamberlain's appeal for further funds for the scientific department of the Birmingham University has been received from Sir James Chance, who has given the sum of 50,000*l.*, subject to conditions to be arranged with the University Council. The endowment fund of the University now amounts to about 400,000*l.*

THE Pass List for the 1900 D.Sc. Examination of the University of London contains the following names:—Experimental Physics: Reginald Stanley Clay, Richard Smith Willows, Harold Albert Wilson. Chemistry: Thomas Slater Price. Botany: Miss Maria Dawson. Zoology: Edgar Johnson Allen, Charles William Andrews.

SOME interesting particulars with regard to chemical and technical education in the United States were given by Prof. Chandler, of New York, in his presidential address to the Society of Chemical Industry last week. The most striking feature of the American system of higher and technical education is the fact that most of the institutions have been founded and maintained by liberal gifts of money from wealthy citizens, in many cases made during the donor's lifetime, and that only a small number have been endowed or supported by the public funds. Thus in 1899 over 33 million dollars were given in this way, the largest sum being the 15 million dollars given by Mrs. Leland Stanford, together with large tracts of land, to which as yet no precise value can be attached, to complete the endowment of the Leland Stanford Junior University. There are in all 174 donors, averaging 190,000 dollars each. Schools of chemistry are now so numerous in the United States that it is almost impossible to state their exact number, but Prof. Chandler said it is more than 100. In all there are 480 universities and colleges, and 43 technical schools. In 1899 there were 9784 students pursuing professional courses in the schools of engineering, while 1487 graduated that year, receiving the degree of civil, mechanical, electrical, or mining engineer. The value to the industrial development of the United States of such an army of thoroughly-trained engineers and chemists cannot be too highly estimated.

THE operations of the Technical Instruction Committee of the Cheshire County Council are extensive and satisfactory. All the sums received under the Local Taxation (Customs and Excise) Act of 1890 have been devoted to the promotion

of technical instruction in Cheshire from the commencement. The Technical Instruction Committee has framed a scheme of work which has gradually embraced the whole county, and has provided for the various and special requirements of the different districts, as well as of the county at large. The annual report just received records a year's work of steady progress and development, more especially in regard to relatively advanced instruction, and improved methods of carrying on the classes. During the year ending March 31, 1900, the grants made for purposes of technical instruction amounted to nearly 17,000*l.*, and this sum will be considerably increased during the ensuing year. A number of secondary schools receive grants from the Committee, and it is proposed to increase the payments to such schools. As has been before remarked in these notes, assistance thus given is having a very important effect upon the character of the education in secondary schools; for a condition of the grant is that scientific subjects should be taught, and proper laboratory accommodation provided. We read, for instance, in the present report: "All the schools to which grants for building and equipping laboratories and lecture rooms were made have completed these additions, hence they are in a much better position to give sound instruction in science subjects, and especially in the practical stage, than they were formerly." It is well to bear in mind the beneficial influence which Technical Instruction Committees have thus had upon the curricula of Grammar Schools and others of the old-fashioned type. Among other matters dealt with in the report are experiments on tuberculosis in cattle, for which the Committee made a grant of 250*l.*, and experimental work in agriculture.

## SOCIETIES AND ACADEMIES.

### PARIS.

**Academy of Sciences**, July 16.—M. Maurice Lévy in the chair.—On the uranium radiation, by M. Henri Becquerel. By mixing uranium chloride with barium chloride and precipitating with sulphuric acid, a precipitate of barium sulphate is obtained which is more or less radio-active according to the quantity of barium salt introduced. The radio-activity of the uranium salt remaining undergoes a corresponding diminution. It cannot be settled from these experiments whether uranium salts possess a radio-active power of their own, or whether this property is due to an admixture of an impurity.—Preparation and properties of two borides of silicon, by MM. Henri Moissan and Alfred Stock. By heating together, with special precautions, in a tube of infusible material a mixture of silicon and boron in the electric furnace, two new borides of silicon are produced, $SiB_3$ and $SiB_6$, which can be separated by taking advantage of the facts that $SiB_3$ is more readily attacked by fused potash, and $SiB_6$ is more readily destroyed by concentrated nitric acid. Both compounds resist the attack of most reagents and are very hard, scratching ruby with facility.—On the crystallisation of gold, by M. A. Ditte. Gold leaf, heated with a mixture of salt and sodium pyrosulphate or ferrous sulphate, is attacked, and shows traces of crystalline structure, although the temperature has been far below that of the fusion of gold. Platinum gives rise to similar phenomena under the same treatment.—On the solubility of calcium phosphate in the water of soils in presence of carbon dioxide, by M. Th. Schlœsing. Neutral $Ca_3(PO_4)_2$, obtained free from sodium salts, is practically insoluble in water free from dissolved carbon dioxide. The solubility increases with the amount of dissolved carbonic acid, but if this is accompanied in solution with the corresponding amount of calcium bicarbonate, the solvent action is practically destroyed.—New researches on double fertilisation in angiosperms, by M. L. Guignard. In addition to the cases previously given of double fertilisation in monocotyledons, this has now been observed in *Narcissus poeticus* and *Scilla bifolia*. In dicotyledons, *Anemone nemorosa* has been most completely studied.—The movements of the air on encountering surfaces of different forms, by M. Marey.—Observations of the planets (F.G.) and (F.H.) made with the large equatorial of the Observatory of Bordeaux, by MM. G. Rayet and F. Féraud.—On the formation of coal basins, by M. Grand'Eury. Remarks on the mode of formation of the Loire basin.—M. Lipschitz was nominated a correspondent in the section of Geometry.—On the instability of certain periodic solutions, by M. Levi-Civita.—On the ternary bilinear forms of Hermite, by M. Louis Kollros.—On the law of corresponding states, by M. Daniel Berthelot. After discussing various modifications that have been suggested for bringing Van der Waals' formula into closer agreement with experiment, the author concludes that the three constants $f_c$, $v_c$, $T_c$ are not sufficient to rigorously define the function $f(p, v, T)$ of a substance. It is necessary to add two new constants, $T_m$ and $v_m$, corresponding to the displacements of the zeros of volume and temperature.—On the temperature of maximum density of aqueous solutions of ammonium chloride and lithium bromide and iodide, by M. L. C. de Coppet. The molecular lowering of the temperature of maximum density varied from 7·16 for ammonium chloride to 8·31 for lithium iodide.—On the electrolytic estimation of bismuth, by M. Dmitry Balachowsky. It is possible to get a coherent metallic deposit of bismuth allowing of washing, provided the following conditions are observed: slight acidity of the solution, absence of large quantities of halogen ions, matt electrodes, and low current density.—On the amalgams of sodium and potassium, by MM. Guntz and Férée. Four amalgams of mercury and sodium were isolated and analysed, $Hg_8Na$, $Hg_6Na$, $Hg_5Na$, $Hg_4Na$. Similar amalgams, although less clearly defined, were obtained with potassium.—On the reduction of tungstic anhydride by zinc: preparation of pure tungsten, by M. Marcel Delépine. Tungsten of a purity varying from 98·5 to 100 per cent. is obtained by heating zinc with tungstic anhydride or with ammonium tungstate.—Action of reduced nickel upon acetylene, by MM. Paul Sabatier and J. B. Senderens. Acetylene does not react upon reduced nickel in the cold if precautions have been taken to remove all traces of hydrogen from the metal by heating it in a current of nitrogen.—Action of cyanacetic esters with substituted acid radicles upon diazobenzene chloride and tetrazodiphenyl chloride, by M. G. Favrel.—On the limits of grafting in plants, by M. Lucien Daniel.—Action of dry and moist air upon plants, by M. Eberhardt. Compared with dry air, moist air increases the development of the plant, both leaves and stem, the diameter of the latter being reduced. It tends to exaggerate the leaf surface and to diminish the quantity of chlorophyll contained in the leaves.—The volcanic rocks of the Somali Protectorate, by MM. A. de Gennes and A. Bonard.—On a marine formation at the bottom of the Cañon of Regalon, by M. David Martin.—On certain substances specific in pellagra, by MM. V. Babès and E. Manicatide.

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